

In the Specification:

Please replace page 1 with the following, including substitution of the title of the invention:

A MEDICAL INSTRUMENT HAVING A FORCE-LIMITING DEVICE ✓

Background of the Invention

al The invention relates to a medical instrument, particularly a surgical instrument with a displaceable push/pull rod arranged on the proximal end of a hand manipulator for activating remote tool parts on the distal end, wherein a force-limiting device is envisaged for limiting the transmission of force from the hand manipulator onto the remote tool parts via the push/pull rod.

Field of the Invention

This kind of medical instrument can for example be a needle holder, a gripping-, holding- or preparation tool, scissors or other instrument, in which the push/pull rod can be moved back and forth using manual force via the hand manipulator, in order to move, i.e. to open and close, the remote tool parts which are predominantly open-ended tool parts.

Description of the Related Art

These known medical instruments available in various embodiment configurations have a long hollow cylindrical shaft, onto the distal end of which the remote tool parts are arranged. The hand manipulator with a rigid handle element and a swivelling handle element is arranged on the proximal end of the shaft. To activate the remote tool parts via the hand manipulator, the remote tool parts and the swivelling handle element of the hand manipulator are coupled via the push/pull rod which is

a1 located in the hollow cylindrical shaft. In this way it is possible to open and close the remote tool parts by counter-adjusting.

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a2 In order to avoid undue excess forces being exerted onto the push/pull rod via the hand manipulator and therefore onto the remote tool parts, a force-limiting device is known in the practical field in which the transmission of force between the hand manipulator and the push/pull forces and/or the remote tool parts is limited by a force-limiting device. This type of force-limiting device is known for example from DE 197 31 453-C2. With this known device the push/pull rod is designed as a two-piece component, in which both the push/pull rod sections are connected to one another by way of a force-limiting device. One section of the rod is designed with a casing comprising an internal steepening flat body wedge across the direction of movement of the push/pull rod. The other rod section has a tapered cone with a corresponding flat body wedge of the casing upon being subjected to tensile pressure of the push/pull rod, through which a portion of the closing force generated is absorbed, so that no further undue excess pressure can be exerted onto the remote tool parts.

In accordance with another known embodiment configuration the force-limiting device is designed as a spring assembly on the proximal end of the push/pull rod and which absorbs a portion of the force transmitted onto the push/pull rod via the hand manipulator.

All these state of the art known force-limiting devices have indeed proven themselves in practice, however their construction is very complicated and time consuming and therefore expensive.

Summary Of The Invention

A2 Moving on from this the invention is based on the exercise of improving a medical instrument of the above mentioned...

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...the undulating force-limiting device are offset at 90° or 135° from one another.

The spring-like elasticity of the push/pull rod can in one configuration of the invention be adjusted through its shape and the number of undulatory curves so that it is possible for the force-limiting device to be adapted to the respective necessary and appropriate closing pressure.

A3 A second embodiment configuration of the invention suggests that the push/pull rod be designed with at least sectional turned spiral coils to provide the spring-like elasticity. Along with the creation of the undulatory curves, the spiral coil configuration of the push/pull rod offers the opportunity for the push/pull rod to flexibly elongate itself in the event of excess tensile pressure.

With this embodiment configuration the spring-like elasticity of the push/pull rod is preferably adjusted through the gradient of the turned spiral coil sections, in which the turned spiral coil sections preferably have a large gradient.

Finally the invention suggests that the spring-like elasticity of the push/pull rod can be adjusted by way of the material used for the push/pull rod.

Further, for technical and production reasons as well as for increasing operational safety, it is suggested that the push/pull rod be made of one uniform piece of material and/or with a virtually constant cross section.

Brief Description Of The Drawings

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Further characteristics and advantages of the invention can be extracted from the following description of the associated diagram, in which the one embodiment configuration for creating a force-limiting device for a...

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...medical instrument according to the invention is depicted. The diagrams show:

Fig 1 is a side view of a surgical instrument according to the invention in the form of a gripping tool.

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Fig 2a a side view of a force-limiting device of a medical instrument per Fig 1 with undulatory curved sections, and

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Fig 2b a side view of the force-limiting device per Fig 2a, however rotated 90°.

Detailed Description Of The Invention

Fig 1 depicts a surgical instrument in the form of a gripping tool 1. The gripping tool 1 has a hollow cylindrical shaft 2 along its lateral length, on the proximal end of which a hand manipulator 3 is located, and on the distal end of which remote tool parts 4 are arranged in the form of two open-ended sections and which can be activated via the hand manipulator 3 of the gripping tool 1.

The remote tool parts 4 are designed so that one remote tool part 4a is rigidly connected to the shaft 2, whilst the other remote tool part 4b is located and can swivel on an axis 5 across from the rigid remote tool part 4a. Understandably it is also possible for both remote tool parts 4 to be designed to swivel.

The hand manipulator 3 for activating the remote tool parts 4 has two handle elements 3a and 3b which swivel on hinge axes 6 across from the shaft 2.

al The connection between the hand manipulator 3 - more precisely the swivelling handle elements 3a and 3b of the hand manipulator 3 - and the swivelling remote tool parts...
